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LIBERAL EDUCATION.

THIS is the subject of an Address, delivered before the Phi Beta Kappa Society, of Harvard College, on the 22d of July, 1858, by Rev. Thomas Hill, of Waltham. The orator indicates the scope of his discussion as follows: "What principles should guide us in the selection and arrangement of studies in the academic course, — that is, in the whole course previous to the student's entering upon the particular special pursuits to which his tastes or his choice of a profession will finally lead him? What branches are essential, and which are not essential? How far should the essential branches be carried? How far should non-essential branches be permitted to occupy the student's time? What powers of the mind most need education? How shall it be given them? What principles should guide us — this is the discussion to which I invite your attention — what principles should guide us in deciding these various points?"

These principles he deduces from a survey of the powers of the human mind and of the objects on which those powers can be exercised. He regards the whole range of the objects of scientific study as included in, and divided between, theology, psychology, history, natural history, and mathematics, which he denominates the hierarchy of sciences.

Respecting the natural order of these branches in the course of education, he arrives at the conclusion "that the mathematics are the preliminary studies; that they should be followed first by natural history, then by history, and finally by psychology and

theology. I do not of course mean that the child is to receive no religious instruction, until he has mastered all that is known on the other subjects; for I have already said that the powers of the soul are developed somewhat simultaneously. The order of succession which I have named applies particularly to the periods of their attaining maturity. What I do intend to say is, that these five branches of studies should, in every stage of common or liberal education, keep proportionate pace with each other; that the parent or teacher should watch the development of the child's mind and character, giving it the higher truth so soon as it is prepared for it; but remembering that one necessary part of the preparation is the study of the lower truths."

Our limits are too narrow for an extended analysis of this remarkable discourse. Our object is to call attention to it, and, if possible, to induce our readers to procure it and study it. Such a noble contribution to the science of education, the progressive teacher cannot afford to be ignorant of. Though fresh and original throughout, it contains nothing extravagant or impracticable. It presents a just idea of a complete and comprehensive education, and the principles which must guide in the pursuit of it. While the author concedes the utility of classical and mathematical studies, and discusses their value in a masterly manner, he contends earnestly for the study of natural science. To give our readers a specimen of the style and spirit of the address, we extract the following passage on

THE STUDY OF NATURE.

"It appears to me self-evident that this highest fruit of learning can be nowhere more surely gathered than from the field of the natural sciences. That which is abstract never appeals so vividly to our feelings as that which is concrete. And while I would be far from implying that education has power in itself to regenerate a human spirit, I think it not inconsistent with that written Word which has beyond controversy been the most powerful of all visible agents in redeeming the human race, to say that the study of Nature in its varied aspects is another of the most effectual modes of calling out the better feelings of the heart. When the abstract teachings of ethics and theology have

been forgotten, and long familiarity with the customs of society has made the soul indifferent to all higher themes, nothing more frequently penetrates to the inner seat of life and awakens those better emotions which are the pride and glory of manhood, than the presence of some natural object of unusual interest or unusual beauty. The sight of a flower, or the song of a bird, recalling the memory of innocent childhood, has frequently melted a heart which would remain unmoved by the logic of an Edwards or the fervor of a Wesley.

"In childhood the senses are open to the reception of truth from the outward world. A child sees and hears a thousand things that escape the observation of a man. Train him in the usual mode of education and he soon loses the habit of attending to outward things, learns to tread upon the insect and to pass by the flowers, to let the birds sing unnoticed, and the pebble glitter untouched. But give him a true education, including in his studies, as a prominent part, the elements of chemistry, botany, and zoölogy, and his eye shall not become dim nor his ear dull of hearing; in manhood his heart will be open to the sweet influence of the flowers, and to the grandeur of the starry heavens; he will read the meaning of each singing-bird, and catch the true expression of the solemn tones of the thunder. When the forest ocean surges under a July breeze, and the clouds sail majestically through the blue sky, they will fill his heart with emotions unknown to one who despises these glorious works of the Most High as being mere matter. I again acknowledge that no course of education can be able to redeem a fallen soul; simple diet and exercise cannot, at least in one generation, remove the taint of hereditary disease. But what study can have a greater effect in leading a student to a reverence for the purposes of God, and for the laws of his own being, than that of those natural sciences which are directly occupied in investigating the thoughts, purposes, and actions of the supreme creative will? And what studies can put into the hands of one who truly desires to serve his fellowmen, more valuable instruments to serve them, than those natural sciences which, through their application to the necessities of human life, and the wants of human society, have so gloriously distinguished the eighteenth and nineteenth centuries? Far be

it from me to disparage the value of artistic, literary, metaphysical, and mathematical culture. I am urging the claims of the natural sciences partly because of the aid which an acquaintance with them can give in the pursuit of all other branches of learning, and in the exercise of all branches of art. From what source does the sculptor draw his inspiration, and what enables him to make a 'statue that enchants the world?' Or how does the painter give to a little piece of canvas a value that endures for ages, and makes every beholder rich? These artists had their sense of beauty cultivated by a reverent contemplation of natural forms and natural colors, their artistic powers of execution guided by a careful study of anatomy, and of the laws of light and vision. What gives the musical composer his power to control the hearts of men? His sensibilities have been cultivated by an attention to the music of nature, and his artistic power guided by a knowledge of the laws of sound and of hearing. What can give a greater charm to the pages of literature and to the periods of the orator than fresh odors from the woods and fields, and living figures from the wild creatures of his own country? The hills of New England would furnish to a thoroughly trained New England orator, a honey of eloquence as sweet as that of the Athenian Hymettus. Where shall the metaphysician learn to correct the wandering of his thoughts, and to keep his feet firmly planted upon the ground of common sense, so surely as in the natural sciences, where alone his theological speculations are secure against both pantheistic and atheistic tendencies, and where alone he can learn his true relation to the wholly mortal races, and his real points of superiority to them? As for the mathematician, it is manifest that he can find no problems for the exercise of his powers in either of the branches of the hierarchy above natural history. As he derives his first conceptions of figure and number from material things, so most of the higher problems which are to engage his attention in the coming centuries will be suggested by an investigation of the forms and motions of the physical universe. The question of the organic forms has scarcely yet been touched, and only the vaguest hints been given either in botany or zoölogy, of the mode by which we can approach the study of the numberless varieties of natural figures."

PRIMARY SCHOOLS.

It is gratifying to observe among teachers and school officers an increasing interest in promoting the improvement of Primary Schools. During the past year this subject has been made more prominent than heretofore in educational reports, and in educational meetings. The conviction is evidently gaining ground, that more attention should be bestowed upon the first steps in education. The importance of employing teachers of superior qualifications in Primary Schools, and especially in lowest classes of these schools, is beginning to be recognized among parents and school committees. We are happy to be able to state that in the city of Syracuse, N. Y., the teachers of alphabet schools receive higher salaries than the teachers of more advanced grades in the Primary Schools. Those who affirm that there is little occasion for the exercise of high talent in the discipline and instruction of young children prove themselves profoundly ignorant of the whole subject. We must divest our minds of the false notion that the first stage of school education consists in nothing more than saying *a*, *b*, *c*. We are sure that no one could ever again entertain such an absurd idea after having heard the description by Geo. B. Emerson, LL.D., at the recent meeting of the American Institute of Instruction, at Norwich, of the method of teaching the alphabet which he witnessed in Prussia. Gov. Buckingham remarked that nothing in all the able and eloquent addresses on the occasion inspired him with so much confidence in the improvement of popular education as what he had heard about teaching the alphabet.

In Boston, the school committee have undertaken to introduce into the Primary School system some valuable improvements. The work is progressing quietly, but surely, and we anticipate highly favorable results. Most of the schools are now graded, so far as the present accommodations will permit. The plan is to place in one room only one class of pupils, that is, only pupils of equal attainments, so that they may be taught, to a great extent, by the collective method. Six grades or classes are recognized in the system. Formerly, all these classes were in each room. The new arrangement, now generally adopted in

the city, affords the competent teachers superior facilities for the application of improved methods of instruction and discipline.

But what is needed more than any thing else for the improvement of primary education is a high degree of the spirit of progress among the teachers themselves. Where a good share of this spirit is found, there we are sure to find good schools. But if this element has been or is now wanting among teachers, the blame is not altogether theirs.

How little have they been encouraged in their efforts for advancement! How inadequately have the best been appreciated and rewarded!

We hope for better things in time to come. Let every one see to it that he performs his own duty respecting this great interest. Much more extensive means must be provided for the training of teachers previous to their entering upon the responsibilities of their office. Committees must pay good salaries, and then insist upon high qualifications. Teachers must be content with nothing less than the highest success.

In relation to this subject Rev. Dr. Lothrop, in the last annual report of the School Committee of Boston, presents the following just and liberal view:

"As parts of a great system of public instruction, it is scarcely possible to attach too much importance to the Primary Schools. They are the base of the pyramid, and in proportion as the base is enlarged and its foundations strengthened, the superstructure can be reared with ease and rapidity, in graceful proportions, and to a towering height. Under the improvements which are now in operation, and others that will be introduced, it is hoped that the children in the Primary Schools will be rescued from that waste of time and misdirection of powers hitherto unavoidable, and so instructed and carried forward, as that every child, on attaining the requisite age, shall be competent and qualified, not only to enter the Grammar Schools, but to improve the privileges and advantages there offered. And in proportion as the children entering the Grammar Schools come thoroughly qualified and prepared, these schools themselves will be improved, and a large number of pupils pass through them at an age sufficiently early to allow them to enjoy the benefit of the High Schools, be-

fore the time arrives at which they wish to leave school for some active employment. Thus, by improving the Primary, we improve the Grammar, extend the advantages of the High Schools, and make our whole system of public instruction, of popular education, what it ought to be, *progressive* and not *stationary*."

PROGRAMME OF EXERCISES.

FOR ONE SESSION OF AN ALPHABET SCHOOL.

(Prepared for the Editor by a Primary School Teacher in Boston.)

9	to	9.10	Devotional Exercise.
9 10	"	9.15	Counting, and Tables in Addition.
9.15	"	9.20	Naming and giving powers of letters.
9.20	"	9.25	Pronouncing words from the board.
9.25	"	9.30	Spelling and analysis of the same.
9.30	"	9.35	Physical Exercise.
9.35	"	9.40	Sitting still.
9.40	"	9.45	Distribution of pencils, &c.
9.45	"	10	Drawing letters, words, figures, and forms.
10	"	10.5	Standing up, marching, or other physical exercises.
10.5	"	10.25	Class and individual recitation.
10.25	"	10.30	Preparation for recess.
10.30	"	11	Recess.
11	"	11.25	Class and individual recitation.
11.25	"	11.30	Exercise, singing.
11.30	"	11.40	Oral instruction and general exercises.
11.40	"	11.45	Collection of pencils, &c.
11.45	"	12	Preparation for dismission.

The following useful remarks accompanied the programme: "The foregoing programme, with slight variation, would answer as well for an afternoon session. The morning devotions would commence with the repetition of the Lord's Prayer by the whole school. Following this, a few passages of Scripture also repeated by the school, then an appropriate song of praise. The devotions for the close of the day would consist of an evening hymn and the Lord's Prayer again. The counting should be brisk and uniform throughout. In naming the letters and their sounds, cards, charts, blackboard, or book, may be used, one or all; the sounds given sometimes on the Teacher's pointing to the sign, at others from its spoken name.

"Especial care is needed to break up a singing tone in spelling

and analysis, for here may be averted the first false step in elocution. Five minutes of rigid quiet may reasonably follow the outlay of nervous energy. Letters, figures, and forms to be copied may be placed one at a time, on the board, by the Teacher,—she then passing among the ranks to encourage the weak, assist the slow, and commend the neat and skilful hand. Capacity in acquiring the alphabet is so varied, that individuals will, after a greater or less number of weeks, emerge from the mass of beginners, and require the use of books. The period on our programme appointed for class and individual recitation would involve both the learning and rendering of these tasks.

"The period for oral instruction affords opportunity for object teaching, reading stories, explaining pictures, or any method of eliciting thought. It is well at such a time to give the scholars examples of pure expression in reading or narration, requiring them at times to repeat a sentence upon its verbal dictation, with varied emphasis, changing its sense in different ways. Faults in advanced reading might thus be effectually prevented. A lively drawing on the board, remaining a half or the entire week, would educate the pupil's taste."

RULES

TO BE DAILY REPEATED IN CONCERT BY THE CHILDREN IN A PRIMARY SCHOOL.

1st. I must be silent when the bell rings.
2d. I must always mind my teacher.
3d. I must come to school every day.
4th. I must never be tardy.
5th. I must not be idle.
6th. I must not lie.
7th. I must not steal.
8th. I must not swear.
9th. I must not be angry.
10th. I must not strike nor hurt any one in anger.
11th. I must be pleasant and kind to all.
12th. I must forgive all who offend or injure me.
13th. I must be clean in my clothes, my face, and my hands.
14th. I must be decent in all my ways.
15th. I must not destroy my books or my slates.
16th. I must not injure any of the furniture of the school.
17th. I must always try to do right.
18th. I must remember these rules, and try to keep them.

TEACHING THE ALPHABET — A SPECIMEN LESSON.

Apparatus.—A blackboard; a chart of easy words of one syllable; an alphabet chart; a set of alphabet cards, with a grooved stick, called spelling-stick, in which the cards may be inserted in spelling words; and a slate and pencil for each child.

Preliminary Training. — Children should not be put to reading immediately upon entering school for the first time. Judicious preliminary exercises will render subsequent progress, not only in this but in other branches, more rapid and satisfactory. The object of these exercises should be to train the ear to distinguish sounds, and the organs of speech to utter them; to form habits of attention and of prompt obedience to all directions; and to excite the curiosity, or desire to learn something. Such being the objects, the judgment of the teacher must guide in the selection and adaptation of the exercises.

Lesson. — The proper preparatory training having been given, the teacher will select a single letter to begin with; it matters little which. Suppose it to be *ă*. The card containing it is placed in the spelling-stick in view of all the class.

T. "You see this letter. Now look at me. You all know me when you see me. Now I wish you to look at this letter, so that you will know it whenever you see it. It stands for a *sound*. Listen, and hear me give the sound."

Having enunciated the sound distinctly several times, taking care to secure the attention of all, the teacher might ask if any one has ever heard the sound before. Some may remember it as given among the elementary sounds of the language. If so, they are pleased to find that the lesson is connected with something learned before. If it is not recalled, give the vowel sounds promiscuously, requesting all to put up hands when they hear it.

T. "Now all give the sound after me; again, again. That is what this letter says. When you read it, you give the sound. You may take your slates, and see if you can make one like it."

Only a few, perhaps, will try at first. But the teacher passes rapidly around, giving a glance at the slates, bestowing commendation on the best efforts.

T. "Erase it. See me make it on the blackboard. I begin

here, and go round in this way. You may try it again on your slates."

The slates are inspected as before; the timid are encouraged, and the letter written for them on their slates. Then the drill on the sound is repeated, and afterwards individuals called up to say it.

If this is found to be enough for one lesson, when the course is resumed, the exercises on *ă* should be reviewed. The teacher will then proceed with another letter in a similar manner, taking one that with the preceding will make a duo-literal word. Suppose it is *t*. The letters are placed together.

T. "You see I have put together the two letters you have learned, and they make a word; wouldn't you like to read the word? Hear me say the sounds, and see if you can tell what the word is. I will give them slowly, — *ă, t.* Can you tell the word?"

After several repetitions, perhaps some one will combine them and say, "*at.*"

T. "Yes, *at;* that is right. Now you have read a word. You often use the word. I am *at* the desk; you are *at* school. Say, We are *at* school. I will write them both on the board. I begin thus and make the first; and then you see how I make the other, and cross it thus. You may take your slates, and make them."

Now the reading-lesson is changed for writing or printing. This having been pursued long enough, the alphabet chart is suspended before the class, and the pupils requested to see if they can see the word. The first who raises his hand is allowed to come out and point to it.

If any time is allowed to elapse before presenting another letter, these steps should be reviewed. The next letter to be learned should be one which with *at* will form another word. Let it be *r.* The same course as before is pursued. First the attention is called to the *form.* Next, the sound is learned. Then it is written, exercising the conception and imitation, and fixing the form in the memory. The three letters are then placed in order, to form the word *rat.*

T. "You see the three letters you have learned. They make

another word. Hear me give the sounds; and then see if you can tell the word, *r-ă-t*. You may give the sounds after me."

If this process is well managed, some one will catch the word. Now as many individuals as possible should be called upon to repeat the sounds while pointing to the letters, and then pronounce the word. It is then written as before. This might be followed by some simple story read or related about the rat. Then the pupils might be asked to tell any thing they know of the rat. The same process as before with the charts. Keep in mind the maxims, — one short step at a time, constant reviews, vigorous exercise of the mind during the lesson.

In the same way make the words, *bat, cat, fat, hat, mat, sat, vat.*

The letter *n* might come next. This placed after *a*, we have the word *an*. Then *m*, which placed before makes *man*. And so make *tan, ran, fan, pan, can*. For the next vowel, take *i*, with *n* making *in*. Then as before form *pin, bin, din, fin, sin, win.*

Thus proceeding through the first reading chart, always using every word learned in oral sentences, and training the class to make them for themselves.

QUESTIONS FOR THE SELF-EXAMINATION OF TEACHERS.

1. Have I been strictly truthful in thought, word, and deed?
2. Has my heart been in my work?
3. Have I been uniformly pleasant in manner?
4. Have I been uniformly affectionate in feeling?
5. Have I been sufficiently calm and self-possessed?
6. Have I exercised sufficient patience and perseverance?
7. Have I governed with firmness and decision?
8. Have I been serious and earnest?
9. Have I talked too much or too little?
10. Have I endeavored to be conscientious and just?
11. Have I been duly sensible of my responsibility?
12. Did I begin the work to-day in the right spirit?
13. Were my scholars punctual to-day?

14. Have I tried to interest parents in the punctuality of their children?

15. Do the scholars improve in this respect?

16. Are my scholars regular in attendance?

17. Do they absent themselves without good cause?

18. Can I not make absence disreputable?

19. Have my scholars been studious to-day?

20. Do I make the scholars feel that idleness is wrong?

21. What have I done to create a love for study?

22. Has the school been orderly and quiet to-day?

23. Have I governed by the right motives?

24. Have I instructed the scholars in good manners?

25. Have I given the scholars proper exercise?

26. Have I carefully regulated the temperature and ventilation?

27. Have I made the school-room pleasant?

28. Have I insisted on neat and cleanly habits in my pupils?

29. Is the school supplied with apparatus, &c.?

30. Do I see that children do not injure the house or their books?

31. Have I been a good example for my pupils?

GREENE'S ANALYSIS.

It may not be amiss, even at this late period, to draw attention to Prof. Greene's *Treatise on the Structure of the English Language*, concerning the value of which our school-teachers seem not to be agreed.

Prof. Greene's grammatical views are based on those of Dr. Karl Ferdinand Becker, of Germany. The peculiar principles of Dr. Becker to which I allude, were introduced by Dr. Kühner into his Greek and Latin grammars, written in German. It is this sprinkling of *Beckerianism* which has given a charm to Kühner's works. These grammars have been translated into English by Prof. Champlin, of Waterville College, and Messrs. Edwards and Taylor, of Andover. To these American translators Prof. Greene acknowledges his obligations. And from

Prof. Greene these same principles have passed not only into various English grammars, but also into the new edition (Boston, 1857) of Andrews and Stoddard's Latin Grammar. That the principles of Becker have suffered much in going this long round, is almost a necessary consequence.

The most interesting and distinguishing feature of Prof. Greene's work is the division of subordinate propositions into substantive, adjective, and adverbial propositions. That is, every subordinate proposition takes the place, and follows the construction, either of a substantive, or of an adjective, or of an adverb. Hence, the simple proposition being once explained, the subordinative compound proposition becomes very easy. This fundamental principle of Becker has been transmitted in Greene's Analysis unscathed. No intelligent teacher can deny the value of this grammatical discovery. It is to be regretted that Massachusetts schools, having once enjoyed the benefit of this important principle, should now adopt grammars which entirely ignore it.

It would be invidious and unfair to notice the other points of Greene's Analysis in which he has marred or corrupted the principles of Dr. Becker. For, mangled as these principles of Becker may be, they have more vitality than the petrified and stereotyped principles for which they have been substituted.

The feature of Greene's work, which has perhaps, more than any other, been injurious to its success, is the prominence which it has given to *phrases*, as intermediate between simple words and subordinate propositions. This makes the work heavy and cumbersome, and has perhaps diminished its popularity. But this principle is not Becker's.

COMPOUND PROPOSITION.

[We take the following from the advance sheets of the "Latin Analyist," a work designed for systematic instruction in the elements of the Latin tongue, by Prof. Josiah W. Gibbs, of Yale College.]

Compound Proposition, with Various Subordinate Propositions.

THE main proposition may be modified by two or more sub-

ordinate propositions, and of course may be almost endlessly diversified.

We shall confine ourselves here to a main or leading proposition with two subordinate propositions.

A main proposition with two subordinate propositions has the following varieties:

1. The two subordinate propositions may have the same relation to the leading proposition, and thus be coördinate to each other; as in a—e.

2. One subordinate proposition may be subordinate to the other, and both to the leading proposition; as in f—m.

3. The two subordinate propositions may be separately and differently related to the leading proposition; as in n—y.

The principles of the notation of compound propositions, employed below, are as follows:

The capital letters A, B, C, &c., are employed to denote the main or leading propositions; the Roman letters a, b, c, &c., to express the propositions immediately subordinate to these; the Italic letters, *a*, *b*, *c*, &c., to express subordinate propositions of the second grade, &c.

The sign of addition + is employed to unite two coördinate clauses.

The mathematical sign $>$ is employed to express the subordination of one clause to another.

The parenthetic marks ( ) are employed to express the insertion of one clause, whether subordinate or superordinate, within another.

The vinculum over the letters is employed to show that the letters over which it stands are to be taken as a whole.

$$\overline{a + b} < A.$$

a Quid quaeque nox aut dies ferat, incertum est.

b Quae parva videntur esse delicta, neque a multis intelligi possunt, ab iis est diligentius declinandum.

$$A > \overline{a + b}.$$

c Socrates accusatus est, quod corrumperet juventutem, et novos deos induceret.

d Cui ignota est urbs illa celleberrima, Athenae, ubi artes et literae maxime floruerunt?

A (a + b) A.

e Homo, quam multa et Deo et hominibus debeat, quotidie recordetur.

$a < a < A$.

f Quid afferres novi, quum ignorarem, servum ad te misi.

$A > a < a$.

g Cave, ne, quae vitia sunt, mores fiant.

$A > a > a$.

h Omnis virtus facit, ut nos eos diligamus, in quibus ipsa inesse videatur.

i Xerxes eo usque luxuria guadebat, ut edicto praemium ei proponeret, qui novum voluptatus, genus reperisset.

j Senatus decrevit, consules derent operam, ne respublica quid detrimenti caperet.

$A > a\ (a)\ a$.

k Non promissa servanda sunt ea, quae sint iis, quibus promisseris, inutilia.

l Justitiae tanta vis est, ut ne illi quidem, qui maleficiis pascuntur, possint sine ulla particula justitiae vivere.

$a < A > a$.

m Quod ipse video, non adeo hebes es, tu ut non videas.

$b < a < A$.

n Ubi redieris, si postulabis librum, dabo tibi lubens.

o Cur nolint, etiamsi tacent, satis dicunt.

$A > a > b$.

p Hominem esse arbitror neminem, qui nomen istius audierit, quin facta quoque ejus nefaria commemorare possit.

q Multa sunt quae nescimus, quorum scientia ne opus quidem est.

A (a) A (b) A.

r Avarus, quo plura habet, eo avidius, quae non habet, cupit.

s Scientia, quae est remota ab justitia, calliditas potius, quam sapientia, est appellenda.

a < A > b.

t Qui erant cum Aristotele, Peripatetici sunt dicti, quia disputabant inambulantes in Lyceo.

b < A > a.

u Ubi redieris, dabo tibi librum lubens, si postulabis.

v Si prudentes essetis, nihil polliceremini, quod praestare non possetis.

b < A (a) A.

w Ubi redieris, librum tibi, si postulabis, lubens dabo.

A (b) A > a.

x Difficile est, quum praestare omnibus concupieris, servare aequitatem, quae est justitiae maxime propria.

y Librum sibi, ubi redieris, lubens dabo, si postulabis.

AMERICAN NORMAL SCHOOL ASSOCIATION.

This Association originated in a convention held in New York city, Aug. 30, 1855; and annual meetings have since been held, at Springfield in 1856, and at Albany in 1857. The last meeting was at Norwich, Conn., Aug. 18 and 19, 1858, during the session of the American Institute of Instruction. A constitution, prepared by a committee appointed a year previous, was presented by Prof. Alpheus Crosby, and was adopted, with some modifications. After a free discussion, the Association was fully organized, and measures were initiated, which it is believed will secure its permanence and efficiency. The importance of such an Association was forcibly urged by the President, Wm. F. Phelps, Esq. of Trenton, N. J., Prof. Crosby, J. W. Bulkley, of New York, Geo. N. Bigelow and J. W. Dickinson, of Massachusetts, Prof. D. N. Camp, of Connecticut, Richard Edwards, of St. Louis, and others.

The Normal School system is still new in this country. It is not yet quite twenty years since the oldest Normal School in America (that now at Framingham, Mass.) was established. The number

has multiplied very rapidly within a few years; and no former year has witnessed the foundation of so many of these important institutions as the last year. They are no longer an experiment. In Massachusetts, where they have been most thoroughly tested, and where time has developed their results most fully, they have been steadily advancing in public confidence, as the people have become more practically acquainted with the actual working of the system, and its influence upon the public schools. Among other indications of this growing sentiment, may be mentioned the fact that the aggregate attendance in the four Normal Schools of Massachusetts is now greater than at any former period. The Normal School is now regarded widely through the country as indispensable to a complete system of public instruction. They are already established in Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Ohio, Illinois, Michigan, Wisconsin, and Minnesota; and in the cities of Boston, New York, Brooklyn, Newark, St. Louis, New Orleans, and others. The next legislature of Missouri will probably establish a Normal School; and measures are in progress which promise similar results, at an early day, in other States.

In view of the recent origin and rapid increase of our Normal Schools, and the consequent want of a mature personal experience in their management, it is essential to their highest efficiency that their instructors should maintain an association for professional improvement Many fundamental points in reference to the distinctive character and specific aim of the Normal School, the methods of instruction, the terms of admission, the length of the prescribed course of study, the prominence to be given to the theory and art of teaching, &c., demand investigation. A comparison of views on these and other important questions, collating the results of the varied experience of those actually in the work in different parts of the country, cannot but render a valuable service to the cause of Normal School instruction.

The next meeting will occupy two days, and will be held the last week of July next, in Trenton, N. J. The exercises will consist of lectures, essays, and discussions.

By order of the Society,

B. G. NORTHROP, *Sec.*

SAXONVILLE, Mass., Sept., 1858.

EXTREMES IN BOSTON PRIMARY SCHOOLS.

[From the Fifth Quarterly Report of the Superintendent.]

One of the most curious of the phenomena observed was the positiveness on the part of some teachers that certain things were impractible, if not impossible; while, perhaps in the next school, the same things were found to be satisfactorily accomplished. This was especially the case respecting the teaching of singing, writing, and the sounds of the letters. Only yesterday, in a school consisting of sixth class or alphabet scholars, of the poorest materials, I witnessed the singing of Old Hundred with a good degree of spirit, if not with the understanding; and I shall take the liberty hereafter to persist in the belief that any school, with proper teaching, can learn to sing. In one intermediate school I saw specimens of penmanship which would be creditable to first class scholars in a Grammar School; while the teacher of another was evidently astonished at the suggestion that writing might be taught in the school. One says that pupils cannot understand the sounds of letters till they get to the first or second class; while another finds it almost the royal road to teaching, from the very beginning, saving much of the labor of telling each scholar, every day, for four years, to pronounce his *ing*. In one alphabet school no books are used, and the teacher has no idea that such little things as compose her school can hold a book and read; while in another every one stands up, keeps his place, and reads in a class. One teacher makes constant use of the black-board, which is doubtless the most valuable piece of school-apparatus yet invented; while another has had them all cleared out of her room as useless lumber. The numeral frame, another excellent article of apparatus, is furnished to every school, yet, according to my best recollection, I never found it in the hands of any teacher. In one school there is remarkable industry, every scholar studying in earnest; in another you may look for an hour without seeing one apply himself with a good will to his lesson. In one the pupils have regular physical exercise, at stated times every day, and they grow comparatively straight; in another they are made to sit as still as rebellious nature will permit, except at recess time, and the two minutes a day occupied in saying *a*, *b*, *c*. In one graded school,

at least half of the pupils are taught in one class, and the attention of all is secured; in another three or four are taught at a time, while the rest are idle or in mischief. Some school-rooms, by scrupulous neatness and the tasteful arrangement of a few articles of ornament, are made attractive and pleasant, while others look naked and cheerless. In one intermediate school the pupils were trained to cleanliness and good manners, with extraordinary success — they were really civilized and refined; while in another the slovenly urchins appear little better than semi-barbarians, the difference being due entirely to the difference in the teachers.

I thought it important to inquire very frequently as to the ages of the pupils in the first and second classes. One teacher, of large experience, takes great pains to send forward the pupils to the Grammar School before many of them get beyond the age of eight, taking care to keep the dull ones from falling back,— while those of premature mental development, with large heads on small bodies, are judiciously restrained, till their physical growth can come up with their intellectual; another does not discriminate, and each is allowed to go his own pace. From one school, but one candidate was sent up to the Grammar School, and he *was sent back*. From a school in the same vicinity, more than a dozen are sent, and they do not miss one question in the examination.

The management of recess deserves more attention than it receives. There is room for much improvement here. At one building where there are six schools, the recess is conducted in admirable order. Wholesome discipline governs everything from the time the pupils leave their seats till they return to them. In other places, the yards during recess are scenes of disorder, and schools, not of moral training, as they should be, but quite the reverse. In one school a firm and gentle rule, and a loving sympathy, holds every scholar in obedience, with bonds as strong as steel, yet light as air. Another subdues opposition and conquers restiveness by the stern sway of the government of force,

> "Where the boding tremblers learn to trace
> The day's disaster in their *mistress'* face."

These are a few of the extremes observed, and I could name, were it necessary, the individuals schools in which they exist.

MUSIC IN PUBLIC SCHOOLS.

[The following elaborate and eloquent address on this subject was delivered at the Musical Festival of the Public Schools of Boston, on the 22d of July last, by J. Baxter Upham, M. D., a member of the Committee on Music. Though published at the time in some of the papers, we doubt not that many of our readers will be glad to see it inserted in our pages, for preservation and future reference.]

Mr. Chairman: — It is, I need not say, with diffidence and with great reluctance that I undertake to speak in behalf of the Music Committee at this time. To speak in public is not my practice. And I assure you, sir, when I consider the wisdom, the learning and elegance gathered about you on this platform, that, were it not for the deep interest the occasion impresses upon me, I should most respectfully but decidedly decline to respond to your call. And I seriously question within myself whether I should not be acting out that discretion which is the better part of valor, if I should *run away*, even now.

A few words may, however, very properly be demanded of some of us, as to the why and the wherefore of this new feature — this innovation, as some may be disposed to call it — in the good old established practice of the annual school jubilee.

A full explanation would involve the history of music, as connected with the system of public school instruction, in other countries and in our own. But I shall not take up time for that, any further than barely to allude to one or two facts and dates.

Passing over this history, then, as connected with Germany, where the system originated, and whence it spread into Holland, into Switzerland, and later into France, we find it at a comparatively recent date engaging the attention of educationists in Great Britain. Not there, indeed, without serious and strong and strenuous opposition at first; for our English brethren are never too ready to espouse any innovation, however much they may be convinced of its utility. So when Mr. Wyse, a prominent member of Parliament, first ventured to hint in the House of Commons that singing should be taught in all the schools, as in Germany, the suggestion was received with ridicule and with laughter.

The same spirit of opposition afterwards elicted from the

celebrated John Hullat, who engaged early and fought long and successfully as a champion in this cause, the quaint but forcible remark, "Yea, verily, thanks to the arduous labors of those who well addressed themselves to ears once as deaf as stone walls on the subject, the principle is now, at length, recognized by all the educational societies in the realm."

Once recognized, it spread rapidly over the country. In Scotland, even, in spite of her national prejudices, among the followers of the sturdy old Covenanters, who had been wont to shake their fists in the face of all such pagan practices, it was shortly acknowledged as a fitting element in the education of her youth.

And in Ireland it followed, as a matter of course, for Ireland is the Italy of the British dominions in the North. In her the genius of music and the arts exists *naturally*, in a greater degree of perfection than in either of her more favored sister realms. The *Harp* is her rightful emblem. The patriot poet, Tom Moore, well knew, as he penned those lyrics and songs which are to Ireland as household words, that he spoke to hearts as readily responsive to the melody of his music as are the chords of the Æolian lyre to the waving of the wind.

About the same time with this movement in Great Britain, occurred the introduction of music into our Boston Schools. Just 21 years ago, on the recommendation of the Boston Academy of Music, it was tried as an experiment, in four only of the grammar schools at first. I need not say the trial was satisfactory, and that ever since music has been recognized as a part of the Boston system of school instruction.

A little more than a year since, a series of orders was offered in the School Board by the present efficient Chairman of the Music Committee, having for their object to raise this department to a nearer level in importance with that of other branches of study. They were passed by a large majority.

It is, sir, the more effectually to carry out the spirit and intention of these orders, that the performance of choral music is to take so prominent a part in the festival exercises to-day; and in this, the becoming of age of the system, so far as Boston is concerned, to inaugurate an advanced and permanent step in its

progress: for if the present experiment, and experiment it must be called, shall prove in any adequate degree satisfactory, it is our hope — I speak, at least, for myself; I believe, also, for every member of the Music Committee, and *I trust* the whole School Board — that, hereafter, a *distinct* and separate exhibition of the musical department of the schools will be annually held, which, from small beginnings, shall grow at length into an important and permanent institution.

I have no time to go at length into a discussion of all the objects, influences, and expected results of such a measure, if adopted and carried out.

I might, indeed, enter into a computation, if necessary, to show what proportion of the twenty-four thousand scholars in our schools may, when the recently adopted system of a more thorough and extended musical instruction shall have come fully into operation, be fitted to take a creditable part in such public exercises. Suffice it to say now, that, judging from the promises in the fifty or sixty primary and grammar schools, which in the distribution of duties it has fallen to my lot personally to visit and examine, the force will ultimately be limited only by the capacity of a building to contain them.

I am aware, sir, of the popular objection against this and all measures of a similar nature proposed in connection with our schools. They tend, it is said, to pre-occupy and engross the minds of the pupils, to the exclusion of more practical things. More than this, it has been asserted that a high degree of proficiency in music is inconsistent with an exalted standard of scholarship. I say this is the common and popular objection; but, like many other popular and traditionary sayings, I believe it to have been too readily taken for granted, without due inquiry as to whether the assertion be founded in fact.

In my own school experiences I remember that many of those who were skilled in music, and largely devoted to the practice of it, were also the first in rank on the merit roll. And I appeal to the worthy and efficient Superintendent of the Boston Schools, with whom I had the honor to be associated as a classmate in college, as to whether his recollections do not tally with mine in this particular. The distinguished scholar, the statesman and

orator, to whose eloquence we hope soon to listen, whose eminent taste in music and in art we all acknowledge and admire, and who himself once played a very acceptable trombone in the Pierian Sodality at Cambridge, can answer for himself and for Harvard. And the number of medal and diploma scholars in these choral ranks is a sufficient refutation of the error, as regards our Boston Schools. I take it for granted for the present, then, that music is in itself a benefit as a study.

The advantages of the plan which we now inaugurate to the schools themselves, so elevating and advancing the standard of musical instruction, are, I think, evident. I need not take up the time to recite them.

Let me allude, however, to one of its natural results, extrinsic to the school, and in my own mind a most interesting and important one, which is this: In the course of a few years a generation will thus be trained up to engage acceptably in the music of the church, in the form of congregational singing; which, when properly done, I hold to be the best and most impressive form of devotional music. Says the good old Roger Ascham, in writing from Augsburg, about the middle of the sixteenth century, on this point, "Three or four thousand singing at a time in a church here is but a trifle." I could wish, sir, such trifles might obtain in the middle of this nineteenth century, in our churches.

This, indeed, is what we have been aiming it and attempting, for so many years, in this country, in vain to accomplish; not because, as has sometimes been said, we have no congregations, nor altogether because our congregations cannot sing, but because, for lack of previous methodical training, they cannot sing together.

Now, once establish the movement, and in a few years the rising generation will have in their heads, in their hearts, and upon their tongues, a repertoire of sacred music, always adapted to the singing of a great congregation, and such as will never wear out.

Once establish this measure, as a *distinct* and *annual institution*, and you make the congregational music of the church as much the property of Massachusetts, and ultimately of New England,

as it is now, in its perfection, almost exclusively that of Holland and certain parts of Germany.

A word as to the impression, as the legitimate impression and effect of the occasion itself, if carried out in its integrity, on both participants and hearers.

The plan, though never to my knowledge attempted here, at least on so large and complete a scale as we propose, is not without a precedent abroad. Hayden once expressed himself as having been never more affected than by the simple singing in unison of the 4000 charity children, under the dome of St. Paul's in London. This was more than half a century ago. The good old custom remains there yet, and in the same form. Nor is it alone in the great and sensitive heart of Hayden, but upon the masses and men of ordinary musical susceptibilities as well, that such effects are produced.

I shall long remember, indeed I shall never forget the impression left on my own mind, on one of these occasions, at which it was my good fortune to be present a few years since. And I speak of this experience in immediate connection with that of the great composer, to illustrate the effect, — the similar effect from the same cause on human natures, though the very antipodes of each other in all things else.

There was, on the occasion to which I allude, an audience of some 15,000 persons, extending out into the naves and transepts of the church. The children, now increased to eight or ten thousand in number, were ranged on benches, rising and receding in amphitheatrical form, from the floor to near the springing of the arch of the dome. They were, in age, about the average of the scholars in our grammar schools, though far inferior to them in point of intellectuality and acquirement. They all sang together in unison, with the harmony only of a powerful organ as a basis, the simple melody of old Gregorian chants and German choruses mostly, though ending, as I well remember, with the sublime Hallelujah chorus of Handel.

Now, how much of that effect may have been attributable, in my own case, to the associations of the time and place, I will not attempt to decide ; but of all my musical experiences before or since — whether of the choicest instrumentation or the grandest

combination of choral harmony — whether I should mention the efficient rendering, by 600 picked voices, of the Elijah and Messiah in this our own Music Hall a year ago — the great choral performances on the opening of the Industrial Exhibition in Dublin, and in various parts of England — the clash and clang of collected scores of military bands in France — in the celebration of high and festal Mass, in the cathedral of Cologne — the shoutings of the huge congregations in the fine old Lutheran temples of worship at Dresden, at Leipsic, and elsewhere — or in the splendid achievements, vocal and instrumental, of those great musical gatherings in the valley of the Rhine, in the vintage time ; — all, all I say, have failed to leave in my memory an effect so deep, so lasting, so solemn, so impressive.

And, if such things can be done in London, they can be done here ; if success such as this can be achieved out of the materials which make up that choir of charity-school children in the cathedral of St. Paul, much more can it be accomplished, in connection with the liberal and enlightened system of public school instruction in Boston, — not in these first feeble experiments, indeed, but by patient, and systematic, and well-directed, and constant, and continual effort.

But this is only an immediate and pleasing accessory of our plan, a gratifying success, indeed, obtained, — and, in my own mind, a desirable one, if it but lead to the addition, in the limited calendar of our festival days, of another, and that so æsthetic and rational a jubilee.

And here again we may be met with the utilitarian objection, *cui bono?* which, by a somewhat liberal translation, might justly be interpreted, in the New England tongue, *will it pay?*

But what, sir, I would ask, in answer to this inquiry, is the end and object of education? Is it to develop the intellectual part of our natures *only*, the *working* faculties merely, to the neglect of the moral and physical, leaving the emotions and affections to run riot or take care of themselves as best they may? Would this be natural, would it be philanthropic, in this our land and in our day? Consider, for a moment, the spirit and tendencies of our country, and the characteristics of its people, — a toiling, speculating, money-getting, fast living, excitable race ;

wearing themselves out with labor or with thought, reckless and impatient always. Was there ever a nation more requiring the amenities of the æsthetic among the harsh and discordant elements of their composition?

Story, in his appropriate ode at the inauguration of our noble statue of Beethoven, well expressed this idea, when he said:

"Never is a Nation finished, while it wants the grace of Art:
We must borrow rules from beauty; life must rise above the mart.
Here, as yet, in our Republic, in the furrows of our soil,
Slowly grows Art's timid blossoms, 'neath the heavy foot of toil.
Spurn it not, but spare it, nurse it, till it gladdens all the land."

And this is what, as a nation, we are just beginning to do. In the cities along our Atlantic shores, at any rate, the galleries of our Athenæums, the recent meritorious collections of pictures, public and private, the growing disposition to ornament with groups of statuary our squares and public buildings, and our National Capitol, and the increasing beauty of our architecture, are witnesses to it.

Says the poet I have already quoted:

"Topmost crown of ancient Athens towered the Phidean Parthenon;
Upon Freedom's noble forehead, Art, the starry jewel, shone."

I would, sir, it might sparkle in the front of this modern Athens as well.

Now music, it has been well said, is the handmaid of painting and sculpture, — their gentle sister, more refining and humanizing in its influences upon the hearts of the people.

Shall we pause, then, or retrograde in this movement which introduced and recognized it in our schools? I do not believe it. I look rather in the future, though the time is not yet, for the completion of the work, by the establishment, in connection with our system of public school instruction, of a Conservatory of Music, *vocal and instrumental*, on a scale commensurate with that of kindred institutions abroad.

But the time fails me to more than suggest these topics. I am aware, sir, that I have already exceeded my allotted time, and I beg pardon for trespassing so long on your patience.

THE MECHANISM OF LATIN HEXAMETER VERSE.

BY PROF. GIBBS, OF YALE COLLEGE.

THE thought or sentiment is the soul of all poetry, yet some value is to be attached to its external form.

The beauty of Latin versification consists in the suitable intermixture of long and short syllables.

This variety of long and short syllables in Latin hexameter verse is effected on the following principles: —

1. The hexameter verse is dactylic, or made up of dactyls. Now the dactyl, consisting of one long and two short syllables, contains in itself an agreeable variety of quantity.

Sed fugit | intere | a, fugit | irrepa | rabile | tempus.

2. As, by the rules of Latin prosody, a long syllable is equivalent to two short ones, a spondaic foot is equivalent to a dactylic, and may be substituted for the same. This interchange of dactyls and spondees produces a melodious variety.

Vi supe | rum, sae | vae memo | rem Ju | nonis ob | iram.

3. The fifth foot of an hexameter verse is properly a dactyl, and the last foot is a dactyl defective in two syllables. As a string of dactyls and spondees, going on in one strain through a whole composition, would be wearisome, these two points mark to the ear the end of the verse, and enable the mind to perceive the harmony of the successive verses.

Discite, | quid vir | tus et | quid sapi | entia | possit.

4. The euphony of an hexameter verse is much increased by the cesura; which leaves a syllable at the end of a word to begin a new foot.

Una sa | lus vic | tis nul | lam spe | rare sa | lutem.

5. The finest cesura is that which falls on the fifth half foot, and divides the whole verse into two parts of a suitable or convenient length.

Aut pro | desse vo | lunt aut | delec | tare po | etae
Coelum, | non ani | mum mu | tant, qui | trans mare | currunt.

6. As a substitute for this principal cesura, we sometimes have two inferior cesuras, one coming before and the latter after the place for the proper cesura.

Infan | dum re | gina ju | bes reno | vare do | lorem.
Inde to | ro pater | Aene | as sic | orsus ab | alto.

It is remarkable how much the melody of hexameter verse depends on principles strictly mechanical. It is believed that the understanding of these principles will greatly help the student to appreciate the beauty of hexameter verse.

OBJECT LESSONS — LINES.

FOR PRIMARY SCHOOLS.

You see what I have drawn on the board.

Are these lines alike?

How do they differ from each other?

One is straight, and the other is not.

We call the one which is not straight a curve line.

You may tell me the names as I point to them.

Which is this? Repeat it.

And this? Repeat it.

James may come and point to the *straight* line. Now to the *curve* line.

You may now make them on your slates.

If I stretch this thread thus, what line does it make?

Now if I bring the ends nearer together, and let it bend down thus, what line does it make?

A line that is not bent in any part of it is called a straight line. Repeat together.

A line that bends in every part, but has no sharp corners in it, is a curve line. Repeat together.

LESSON SECOND.

Having reviewed the preceding lesson, the teacher proceeds:

You see I have made a line straight up and down.

When a line is made in this direction, we call it a perpendicular line.

You may say *perpendicular line.*

We will analyse the word perpendicular.

You may make four on your slates.

I will look at some of your slates.

Jane has made them very well.

Look at Jane's ; you see they are straight up and down.

Now erase them, and try again.

Now see me make one on the board (an oblique one).

Is it right?

It is *not* straight up and down.

It is not *perpendicular*, you mean.

Well, I will make this one right.

You may try again.

Edward may come up and hold this pointer in a perpendicular direction.

Tell me what you see in the room that is perpendicular.

The sides of the door, and of the windows, and of the blackboard.

LESSON THIRD.

Review the preceding lesson.

Horizontal line. Now I have made a straight line across the board. When a line is made in this direction, we call it a horizontal line.

You may say *horizontal line.*

Analyse the word horizontal.

The pointer is now horizontal.

Who will come and hold it in a horizontal direction?

You may make four horizontal lines on your slates.

(Proceed as in Lesson II.)

LESSON FOURTH.

Review as before.

Is this straight line perpendicular?

Is it horizontal?

Oblique Line. This is a slanting or oblique line.

You may call it an oblique line. Say *oblique line.*

Analyse the word oblique.

You see it leans towards the right.

Now I will make one leaning towards the left.

Mary may come and point to the one that leans to the right, to the left.

(Illustrate with the pointer. Proceed as in Lesson II.)

LESSON FIFTH.

Here is a perpendicular line, a horizontal line, and two oblique lines.

Which is this (pointing to the horizontal line)?

A horizontal line.

This?

A perpendicular line.

This?

An oblique line leaning or inclining towards the right.

This?

An oblique line inclining towards the left.

You may all lean towards the right, — left, — stand up straight in a perpendicular position.

Hold out your arms in a horizontal position.

Make these lines on your slates.

Tell the names as I point to them.

LESSON SIXTH.

Parallel Lines.

I have made two straight lines. You see they are just as far apart in one place as in another; they run in the same direction.

If two straight lines are just as far apart in one place as in another, they are parallel.

Do you see any things in the room parallel?

The two sides of my slate, the two sides of the door, of the window, of a pane of glass; the wires of the numeral frame.

Now I will make three parallel lines.

You see three on your slate frame. (Holbrook's.)

Make three just like them on your slate.

(Practise on these some time; then proceed in the same way with the horizontal and oblique parallel lines.)

Remark. — The preceding lessons on lines are adapted to children who have not learned their letters. If they are given to children who have learned to read, the names should be spelled, written on the board by the teacher, and on the slates by the pupils. What has been learned of the lines should be applied in learning the alphabet; referring to the chart of plain capitals, and pointing to the parts of different letters, ask the pupils to say whether the part designated is curved or straight. Then request the scholars to point to the letters which have no straight lines, and those which have no curve lines.

Resident Editor's Department.

AMERICAN INSTITUTE OF INSTRUCTION.

(Continued from page 358.)

Discussion — Education of the Sexes together.

Mr. Elbridge Smith, Principal of the Norwich Free Academy, had been designated to make the opening remarks, and he proceeded to speak as follows: —

The education of the sexes is a subject on which, doubtless, there is a diversity of opinion, as there certainly is of practice, throughout the country. We may examine the subject from two points of view, theoretically or practically. We may look at the nature of mankind, and inquire what are the capacities, sympathies, and mutual adaptations of the sexes to each other, and from this *a priori* point of view determine whether this is the best method of education; or we may take the more practical, experimental view of the subject, and inquire what have been the results of observation and experience in regard to the operation of both systems, — the separate and the mixed.

In order to found a just idea, I suppose the subject should be examined from both points of view. We need not, however, bestow much time on the first, for I presume there is little need of argument here or elsewhere respecting the adaptation of the sexes to each other in all the departments of life. Certainly, the appearance of this audience is an argument in favor of it. In our churches, steamboats, cars, and wherever we go, we find the sexes mingled. We also know that there is no high degree of civilization where they have not thus freely mingled. The general question, I think, may be regarded as settled; on this, I presume, there is no difference of opinion.

I suppose the question to be narrowed down to the period of pupilage, the earlier period of life, and so may be put thus: "Is it desirable that the sexes should be educated together during that period?"

But even now the question is not reduced to its strictest analysis; for during this period the sexes mingle at various times in other places, if they do not in the school-room. The question then may be narrowed down to this: "Is it best, that, in the school-room, the sexes should be mingled during the period of their education?" Being narrowed down to this point, we might almost consider the question settled; for the burden of proof certainly lies entirely upon those who would disapprove of the education of the sexes together. If in general intercourse, at the fireside, around the family altar, in the social meeting, in the house of God, if everywhere else the sexes are brought together, not only without harm but with great advantage, if this mutual intercourse is not only not harmful, but absolutely essential to a high civilization, certainly the question comes home with very great force to my own mind, — I confess, with resistless force, — why should they be separated in the school-room? I think, therefore, we may dismiss this view of the subject with a very few remarks; we may regard as settled, as proved, as a fair and just inference from the general proposition, that in the school-room as well as elsewhere the same benefits will result from the mingling of the sexes.

The only point, I suppose, respecting which solicitude is felt, is that the mora

purity of the sexes is in danger. There may be various starting-points scarcely worthy of notice; but I suppose the great point is that the moral purity of the sexes is more endangered by the mixed system than by the separate system.

Now I maintain, on this subject, that it is a very great mistake to suppose that the Creator himself did not make the best possible arrangement. We are assured on the highest authority that "it is not good for man to be alone," nor woman alone, in any high state of civilization. Why, then, should they be found alone in the school-room? When we say "it is not good for man to be alone," we use the term in a generic sense, and we do not mean men of thirty, forty, or seventy years of age. I suppose the idea to be that it is not good for man at any age to be alone. In all the stages of human existence, from the cradle to the grave, the law of God is that they should mingle virtuously together.

But we may inquire what are the testimonies of experience; what are the practical results of the course? A very wide field opens before us here. I might occupy much time in giving the results of my own observation. I believe, Mr. President, that the only virtuous method of education is by means of having the sexes brought together in the school-room. I do not say that virtuous young ladies and virtuous young gentlemen are not found in other schools, but I do mean to say that just so far as we depart from a mixed system we depart from the order of nature, and that it will be found by the results of all experience that this is the case. The very evils which are thought to result from the union are in fact most effectually prevented thereby. It is an idea prevailing very commonly among the higher classes of society, that female purity is in danger when brought in contact with the opposite sex in the school-room. So far is this from being true, that you do in fact erect barriers around that purity by bringing them together under proper circumstances; you establish safeguards in comparison with which bolts and bars and towering battlements and moated walls are as the spider's web. You know, Mr. President, how slight is the security in all the appliances to which I have alluded, how small obstacles they offer to unbridled passion. But there is a security in that sentiment of honor, — it deserves a higher name, unless you call it Christian honor, — that sentiment which arises unbidden in the breast of every honorable youth, as he associates freely with the opposite sex, and to think of them not merely in the opposite relations in which they present themselves to the imagination, but to think of them as intellectual beings. The circumstances most favorable for the development of this sentiment are to be found in the school-room, — a sentiment that rises in the mind of every honest-minded boy and every honest-minded girl.

I will mention one instance. Some years ago, in my own school, at a distance from the school-house, a boy used an unguarded expression in the presence of some young ladies. His associates took him aside, and said to him, "If you do that again you shall be flogged. If the matter does not come to Mr. Smith, we will do it ourselves." In that school, during my connection with it, that sentiment was maintained. Never, during my connection with the school, was its moral purity disturbed, except when scholars were introduced from schools where the sexes were not brought together. I do not mean to say that they all came in impure, but I do mean to say that I felt solicitous whenever a boy or girl came from a school conducted on the separate system.

After relating an incident connected with a visit to his school by an English lady, to show with what surprise she regarded the practice of allowing large boys to go off into recitation-rooms to recite in their classes to the female assistants, he said those females would have protectors in those boys equal to brothers or fathers.

To fortify his own positions, Mr. Smith read some extracts from Dr. Quincy and Mrs. Jameson, and concluded by saying, "If you will go through the country,

and compare the separate with the mixed schools, you will find that the boys in the mixed schools are more manly, more polite, and the girls are more ladylike and more amiable, as well as more intellectual. It is a mutual and common benefit; and it is a libel on both sexes, a libel on human nature, — I repel it with scorn as a libel on our own sex, — that we do not give as well as receive a benefit from the arrangement."

Benjamin Greenleaf, Esq., of Bradford, said it was not true that practice always makes perfect; but he would nevertheless give the results of his experience, which commenced in 1805, since which time he had taught in every description of school, and had had scholars of both sexes, from five to about fifty years of age. He had never known but one case of an accident resulting from having boys and girls recite together in the same class. There was one "sad catastrophe." The young ladies and a young gentleman were reading Cicero together, the young ladies read so much better than he that he left the school in disgust. He was an excellent young man, became a mechanic, and died worth $100,000. In conclusion, Mr. Greenleaf said: "Put them together, under one teacher, in one room, have good rules and put them in execution, and there will be no difficulty in educating the sexes together, and both will behave better in all respects."

Mr. Richard Edwards, Superintendent of Schools in St. Louis, said there was quite a difference in the character of the arguments to support the one side or the other of this question. On one side is the argument of authority, which has hitherto been in support of separate schools. The schools of the olden time, since the Christian era, were for men; and, so far as females were educated at all, they were educated separately. The Roman Catholic Church still persists strongly in this system. England has adopted the same system, and we follow the example to a great extent. So that we must show that it is best to unite the sexes in one school before we can remove the argument which authority gives. Let us ask how to account for the fact, that, from the remotest periods, this separate system has existed, if it is the false one. How does it happen that the most earnest and best of men, through the centuries, have held the opposite opinion, if it is really true that it is best to join boys and girls in schools just as we do in other places in life? I account for it by the fact that education, as a science, is now comparatively recent. I do not forget that noble, earnest, pious men were engaged as teachers; I do not forget Milton and Roger Ascham: but the science is recent. So long as education was limited to a few persons, why should there be a system? But in our day it has come to be considered necessary to educate the mass of men and women; it has come to be a theory that there is not an intellect born into the world which may be permitted to grow up in ignorance; that God will call to account for the right education of all; and that the community that fails in its obligation in this respect fails in its obligation to the Creator.

When we look at the history of the middle ages, we shall see that the fact of the education of the sexes separately belongs to a class of facts; and whatever accounts for that class will account also for this. We have been afraid that moral purity will be injured, particularly among the girls, if they are educated together. I have seen this opinion in the community where I am, but it is rapidly wearing away. Our High School has done much to kill that prejudice. Do we not know some other systems which we look upon as unnatural, which are founded on the same idea, that, to preserve female purity, the sexes must be kept apart? How was it that men were shut up in cloisters, and women in nunneries? Whatever accounts for convents will account for the system of separate schools, and the same sentiment which is killing out the one will kill the other.

The arguments from other sources are also in favor of a union of the sexes in the schools. In the first place, the education of the sexes together is absolutely necessary to make the perfect man or the perfect woman. The moral constitutions of the male and female are the complements of each other. Com-

paring mankind, as a whole, to the magnet, we have the two poles as in the natural magnet; and, when the influence of the one comes near that of the other, the effect is to intensify the power of each.

It is not true that a lady is more lady-like when shut up from male society, nor that men are more manly when shut out from the society of females. Are the monks more manly than those men who move about in the world? When we withdraw men and women from the trials and temptations of society, we take away that which tends to strengthen, purify, and ennoble, and to educate them for eternity. The man separated from female society becomes effeminate, less manly and less noble. All history sustains this position. The woman separated from male society, on the other hand, becomes more masculine and less refined.

The design of the Creator may be seen in the fact that we do not find the sexes born in separate families, — one family all boys and another all girls. If it was intended they should be kept separate, this would have been the arrangement. When we separate them we disregard the intention of the Creator, and set up our will against what he has seemed clearly to reveal.

Geo. B. Emerson, Esq., of Boston, inquired what was Mr. Edward's opinion as to the influence among grown men and women, as in the Normal Schools.

Mr. Edwards replied that his remarks had been based upon opinions formed from experience in the Normal School.

Mr. Jacob Batchelder, of Salem, said: Mankind is dual, composed of two sexes. This is an improvement upon the first attempt at creation. He said his attention had recently been called to the subject of the rotiferæ; of which class of animals some females lay only eggs that produce males, and others lay only those that produce females. The arrangement for the birth of males and females in the same family is an improvement on the first order of things; for the earliest order of creation was among the class of lower animals like the rotiferæ. And, as woman is the crowning work of creation, we may with some confidence assert that the male man was only an unfinished creation, and that the next step was to finish him.

The telegraph may as well operate without the two poles of magnetism as schools be carried on with only the males of the human race. Mr. B referred to his own long experience for confirmation of his position, and thought that the dictates of experience might be safely relied upon. His own had proved to him that the practice of having the boys and girls educated together in the same school-room was decidedly the best. Boys, though not influenced by the consideration of the importance of education itself, will yet be influenced by the opinion of female associates; so, too, the female will feel it necessary to learn her lesson, in order to perform her duty well at the recitation. There are some things to be learned from each other also. The female character will acquire power, resolution; while the boy will find his rudeness, and regardlessness of the civilities of life, worn away by connection with a softer and a better nature.

Mr. George B. Emerson, of Boston, said he feared, from the remarks of Mr. Edwards, that he thought that he (Mr. Emerson) held opinions different from those expressed by Mr. Edwards. It was not so. My experience, said Mr. Emerson, has been very inadequate. I have been a long time a teacher; but always a teacher of either young ladies alone, or young gentlemen alone, when in college, or boys preparing for college. I agree entirely with the observations made by gentlemen so far, without exception. I would beg to say to the gentleman from St. Louis, who has so well urged his point, that the reason all authority is on one side is, it is a modern discovery, an American discovery, that every woman is to be educated, as well and as highly as every man. (Applause.)

A gentleman from Sweden, a few years since, went with me to visit the Normal School at Newton, to learn what he could that he might apply for the improvement of the schools in Sweden and Norway. He saw how beautifully the work was done there; and when he came away he said, "My question is

answered, this is what we want in Europe. There are multitudes of women in Sweden who can be employed to teach."

Women need to be educated as well and better than men, because they have a higher work to perform. In their hands is placed, by the Providence of God, the formation of the moral, spiritual, and intellectual character of every child. They are, no matter what arrangements we may make, the teachers of us all. This shows the importance of having every woman educated as highly as possible. There are truths now taught in our common schools which far transcend the highest attainments of the ancients. Great truths that are passing into an axiomatic state have become necessary to be known in order to secure the highest welfare of society, and they should be infused into the earliest lessons of children. It is, therefore, necessary that there should be those prepared to teach these great truths, even in the nursery, so that all mankind may, from their early years, go on in knowledge continually. How is this to be done, unless women are educated as well as men, and better? In this view, the question offers a wider field than has been presented. The question is now whether the colleges in the land shall be opened to females just as freely as to males. (Applause.) There is a college of that kind, with as able a man as ever worked in the educational field in New England, at the head of it, working at this moment with perfect success. The question which now agitates the Trustees of the University of Michigan is whether it shall be opened to females. It is, therefore, a question as important as any which can come before a body of teachers. We want all the light from experience that we can have. Considering the fact that the whole of the early forming period of life is in their hands, I as firmly believe, as I do any other fact, that all the teaching should be given to females, even up to the age of twenty. I do not mean the superintending, the general ordering, — but the teaching should be by them. I do not believe men should be excluded from any college or school, but I do believe it is a great mistake to exclude those whom God has constituted as the best teachers from teaching. The question is, how it can be done to the best advantage.

Dr. Sears suggested that the Institute would be pleased to hear the views of Mr. Emerson, as drawn from the observations he had made in Europe.

The President also expressed the hope that Mr. Emerson would continue his remarks on that subject.

Mr. Emerson said it would give him great pleasure to go fully into an answer to the question. He would, however, as there would not be time for that, state the conclusion to which he had come on the continent of Europe, which is, that the teachers there have not yet got their eyes open as to the sphere that woman should occupy. He examined particularly the Normal School in Berlin. It was not the very best in Prussia, and certainly was not the poorest. He stayed a week in the school, and heard every teacher deliberately, and attended carefully to an examination of all the pupils in all the studies of the term; and he was obliged to come to the conclusion that the Normal Schools of Prussia — if that was a fair specimen of them — were not for a moment to be compared with those of Massachusetts. Young men, and young men only, came to be examined. It is not so in Massachusetts. Here only a few young men attend the schools,—those who have a genius for teaching. Young men there teach because they cannot succeed in a profession, and will not work. Almost all of them, if they were to come to the Normal Schools of Massachusetts, would be told, "Go dig, go plough, do anything you can; God never made you for a teacher."

It must be said, however, that the Normal Schools in Prussia have unquestionably retrograded vastly in a few years. The present King of Prussia is afraid that his subjects will be educated too well. He removed a man of high intelligence from the school in Berlin because he belonged to the party of progress, and introduced a man — a most excellent man — who belongs to the class who think that "fear God and honor the King" is all that need be taught. They have not made the discovery that one would suppose they would have made,

that woman is the true teacher. They employ men, therefore, to teach in the common schools who have not capacity to do anything else.

In that same city, I went into the higher seminaries,—the Gymnasia; and there I saw teaching such as I never saw before,—better than I ever saw anywhere else. The languages were taught perfectly, admirably. But this is not the instruction for the common people. The King of Prussia wants to educate the common people to be common people. *We educate the common people because we are the common people.* (Applause)

The question was then laid on the table; and, after a hymn by the school choir, a very interesting address was given by T. W. Valentine, Esq., of Brooklyn, N. Y. His theme was "*Words Fitly Spoken*," and his able effort was to show the importance of right words, at the right time, with the right spirit, and in every way with a fit utterance in the school-room. The address was heartily applauded.

At the close of the address, Mr. Emerson was requested to resume his remarks on the Prussian system, and he again took the floor. After expressing his gratification with the address of Mr. Valentine, and speaking of the importance of moral instruction, sanctioned by the words of Christ or his Apostles, he went on to say that he would state his impressions of the schools in Germany, with reference to three particulars. The most striking and beautiful lesson he heard in Germany was in Dresden, conducted by a man of very high qualifications. It was a lesson in teaching the alphabet. Young ladies and young gentlemen are very apt to think, "What a drudgery this is! Only think, that, with my qualifications, I should be content to teach the beggarly elements! What a position! Oh that I could be in a sphere fitter for my capacities!" That is a great and fundamental mistake which leads any teacher to utter such words. *There is no lesson ever taught in any school so important as the alphabet.* Teaching our crabbed English language is the hardest thing in the world. Our language is the hardest one to read, from the fact that there is not the most remote connection between the words used and the sounds expected. There cannot be a higher office than that of giving the very elements of instruction.

What was very striking, in connection with the school at Dresden, was, that the teacher had a class of about forty boys, all nearly of the same age, and none of them less than seven years old, coming for the first time to learn the alphabet. Those sensible people who wish to make as much as possible of their scholars do not allow their children to be taught the alphabet before they are seven years old. The admirable teacher of these boys began by drawing a fish, and asking the boys to tell what it was. Some said it was a fish, some that it was a picture of a fish; but some that it had no color, and therefore was not a *picture*, but something the teacher drew. So they arrived, after a series of questions, at the conclusion that it was a *drawing* of a fish; not a picture, because that would have color; and not a fish, because that would have life. Then all the class were called on to say, together, "*That is a drawing of a fish.*" As that would form a good sentence, they were required to repeat it till they could utter it as well as possible, giving every articulate sound clearly. Then he would ask each one to read the sentence. Then from a set of large blocks he selected the letters to spell the word *fish*, and having shown them to the class, he asked them to select the letters to spell it, then to go to their seats and draw the letters on their slates. Some would succeed well, and some would fail entirely; but to those that failed there was no reproof, though to those that succeeded words of encouragement were given.

In about ten minutes he called on the boys again, and inquired, "What is a fish?" and put several questions to lead them to think about a fish, and would converse with them about the facts in its natural history; and at each conclusion he would make them express their conclusion as well as their organs could utter

it. That was the striking thing,—the lesson in making sentences, in speaking good German, and in pronouncing correctly.

The first thing to be noticed here is the fact that a gentlemen of the highest intelligence, possessed of all knowledge, a beautiful knowledge of natural history, did not think himself degraded in the least degree by teaching the alphabet. Another thing to be noticed was that those things which, in the old fashioned schools, were considered unsuitable, they were encouraged to do,—that is, to make pictures. Another thing that was very noticeable was the thoroughness with which the languages were taught in the gymnasia. The master would have forty boys of just the same age and the same attainments. The little which the teacher attempted to teach at one time was a striking feature of the instruction. A single short sentence of three words was given; but in regard to them he led them to observe everything, and reviewed everything they had become familiar with, and they were kept familiar with it by continual repetition. After they had learned a single sentence, they were to use that in making other sentences. The degree of thoroughness with which this instruction was given almost transcends belief.

The thorough system of gradation was then spoken of and commended.

After some business matters had been acted upon, the Institute adjourned till half-past two o'clock.

[*To be concluded in the November No.*]

Mathematical.

RATIO AND PROPORTION.

RATIO. — Ratio is the relative magnitude of quantities. Quantities must be similar, in order that their magnitudes may be compared. If one house is twice as high as another, their heights are in the ratio of 2. The ratio of $50 to $100 is $\frac{1}{2}$, because $50 is $\frac{1}{2}$ as large as $100.

To find the ratio between two quantities, one is divided by the other, to see how many times it will contain the other. Hence a ratio is expressed by the sign of division. The ratio of 32 to 8 is found and expressed thus, $32 \div 8 = 4$, or $\frac{32}{8} = 4$. For convenience, however, in distinguishing a ratio, the sign of division is generally used without the horizontal line, thus, $32 : 8 = 4$, which is read, the ratio of 32 to 8 is equal to 4; or 32 divided by 8 equals 4. The first term of a ratio is called the antecedent, the second term the consequent.

RULE. — To find the value of a ratio, *divide the antecedent by the consequent.*

Ratios are of two kinds, simple and compound. A simple ratio is where one quantity is compared with another similar quantity. A compound ratio is where two or more quantities are compared with two or more other similar quantities.

Example 1. — What is the ratio between 12 feet and 4 feet? 12 ft. : 4 ft. = 3, answer. This is a simple ratio.

Example 2. — What is the ratio between a field 6 rods long and 4 rods wide, and another, 4 rods long and 2 rods wide? $\overline{6 \times 4} : \overline{4 \times 2} = 3$, answer; or, as it would generally be expressed, $\frac{6}{4} : \frac{4}{2} = 3$. This is a compound ratio.

Rule. — To find the value of a compound ratio, *divide the product of the quantities in the antecedent by the product of the quantities in the consequent.*

Example 3. — How much more work will 8 men do in 12 days, than 3 men will do in 16 days? Answer, 2 times. Operation, $\frac{8}{12} : \frac{3}{16} = 2$, or $\overline{8 \times 12} \div \overline{3 \times 16} = 2$. (Examples in ratio can often be much abridged by cancellation.)

Example 4. — How much more will be the interest of $100 for 8 years at 6 per cent, than that of $25 for 16 years at 3 per cent? Answer, 4 times as much. Operation:

$$\begin{matrix} 100 & 25 \\ 8 : 16 = 4. \\ 6 & 3 \end{matrix}$$

Proportion. — Proportion is the equality of ratios. Thus, the two ratios of 12 feet to 3 feet, and of 20 acres to 5 acres, are said to be in proportion; for 12 ft. : 3 ft. = 4, and 20a. : 5a. = 4. A proportion is expressed by writing the ratios with the sign of equality between them, thus, 12 ft. : 3 ft. = 20a. : 5a. For facility in distinguishing a proportion from an equation, four dots are generally used to denote the equality, instead of the parallel lines; e. g., 12 ft. : 3 ft. : : 20a. : 5a., which would be read, "the ratio of 12 feet to 3 feet is equal to the ratio of 20 acres to 5 acres."

As there are two kinds of ratio, so there are two kinds of proportion, — Simple and Compound. A Simple Proportion is the equality of simple ratios, as $12 : $2 : : 6 rds. : 1 rd. A Compound Proportion is where one or both of the ratios are compound, as $\frac{12}{2} : \frac{6}{2} :: 4 : 2$, or $\frac{12}{3} : \frac{3}{4} :: \frac{6}{9} : \frac{3}{6}$.

In every proportion, since it consists of two ratios, there are two antecedents and two consequents. In this proportion, 12 ft. : 3 ft. : : 20a. : 5a., the antecedents are 12 feet and 20 acres; the consequents 3 feet and 5 acres. The 12 feet and 5 acres are the two extreme terms, or extremes, and the 3 feet and 20 acres are the two middle terms, or means.

(It is evident that a proportion must always consist of at least 4 terms. Hence such expressions as the following, which are often seen in schools, are incorrect, and should never be allowed, 12 : 3 : : 8. When one term is unknown, its place should be filled by the letter x, or some other similar character.)

In every proportion, since the ratios of which it is composed are equal, the first antecedent will be just as much larger or smaller than the first consequent, as the second antecedent is larger or smaller than the second consequent. Hence, in a proportion, *the product of the extremes is always equal to the product of the means.* By the application of this principle, if one term, or a part of one term of a proportion is unknown, it can easily be found; for when one factor of a composite number is given, by dividing the number by that factor we obtain the other. Therefore, in a proportion, if one of the

extremes is wanting, *divide the product of the means by the given extreme*, and the quotient is the required extreme. So if one of the means is wanting, *divide the product of the extremes by the given mean*, and the quotient is the required mean. Thus, if $84 : 8 :: 21 : x$, then $\frac{8 \times 21}{84} = 2$, which is the fourth term. And, if $84 : x :: 21 : 2$, then $\frac{84 \times 2}{21} = 8$ which is the second term. So in a Compound Proportion, if $\begin{matrix}12\\3\end{matrix} : \begin{matrix}3\\4\end{matrix} :: \begin{matrix}6\\x\end{matrix} : \begin{matrix}6\\3\end{matrix}$ then $\frac{12 \times 3 \times 6 \times 3}{3 \times 4 \times 6} = 9$, which is the unknown part of the third term.

Application of Proportion. — A large class of examples usually performed by analysis can also be performed by proportion. This method of performing these examples is more artificial and mechanical than ordinary analysis, but still should not be "passed over," as is often done, for many reasons. It is well adapted for the development of the reasoning faculties of the pupil; it is often more expeditious and less liable to inaccuracies than analysis, especially in Compound Proportion. It is absolutely essential to any one who wishes to obtain a thorough knowledge of the noble science of Pure Mathematics, or indeed to one intending to pursue any of the higher branches of Mathematics.

Rule. — *Select two ratios upon which the question depends, and one of which contains the unknown term; arrange their terms so that the ratios will be equal; then form from them a Proportion, and obtain the unknown term by the principle that "the product of the extremes is equal to the product of the means."*

Example 1. — If a man earn $24 in 2 months, how much will he earn in 9 months?

Operation.

$$\$24 : \$x$$
$$2 \text{ mos.} : 9 \text{ mos.}$$
$$\$24 : \$x :: 2 \text{ mos.} : 9 \text{ mos.}$$
$$\frac{\$24 \times 9}{2} = \$108. \quad \text{Ans.}$$

Explanation. — There is a ratio between $24 and the $x, for they are similar quantities, both dollars; likewise between 2 months and 9 months, for they are similar. These ratios are equal, for the money earned in 9 months will be just as many times $24, earned in 2 months, as the 9 months is times 2 months. Then expressing the proportion, we find the unknown term as above. (It makes no difference how the ratios are placed in the proportion, as above, or $2 : 9 :: 24 : x$.)

Example 2. — If a pole 9 feet high cast a shadow 18 feet long, how long a pole will it require to cast a shadow 24 feet long?

Operation.

$$9 \text{ ft.} : x \text{ ft.}$$
$$18 \text{ ft.} : 24 \text{ ft.}$$
$$9 \text{ ft.} : x \text{ ft.} :: 18 \text{ ft.} : 24 \text{ ft.} \qquad \frac{9 \text{ ft.} \times 24}{18} = 12 \text{ ft.} \quad \text{Ans.}$$

Explanation. — There is a ratio between the 9 feet and the x feet, for they are similar, — both feet and *both heights;* likewise between the 18 feet and the 24 feet, for they are similar, — both feet and *both shadows.*

Example 3. — If 6 men eat a barrel of flour in 60 days, how long will it last 9 men?

Operation.

6 men : 9 men
60 days : x days

6m. : 9m. : : xd. : 60d. $\qquad \frac{60\text{d.} \times 6}{9} = 40\text{d.}$ Ans.

Explanation. — We find the ratios as before; but it is evident that the flour will last 9 men as much *less* than 60 days, as 9 is greater than 6. Hence the x days being smaller than 60 days, to make the ratios equal, one of them must be inverted; i. e., *if the smallest term stands first in one ratio, it must also in the other, and vice versa.*

Examples in Compound Proportion are performed in precisely the same way.

Example 4. — If 6 men in 8 weeks can build a wall 400 feet long and 8 feet high, how long a wall that is 2 feet high can 12 men build in 4 weeks?

Operation.

$\begin{matrix} 6 \text{ men} \\ 8 \text{ weeks} \end{matrix} : \begin{matrix} 12 \text{ men} \\ 4 \text{ weeks.} \end{matrix}$ First ratio.

$\begin{matrix} 400 \\ 8 \end{matrix} : \begin{matrix} x \\ 2 \end{matrix}$ Second ratio.

$\frac{6}{8} : \frac{12}{4} :: \frac{400}{8} : \frac{x}{2}$, $\qquad \frac{12 \times 4 \times 400 \times 8}{6 \times 8 \times 2} = 1600.$ Ans.

The *statement* in Compound Proportion can be obtained easier by applying the principle that "whatever ratio there is between two causes at work for the same end, there will be an equal ratio between the effects produced." Thus (*Example* 4) the first cause is 6 men at work 8 weeks, the second cause 12 men at work 4 weeks; the effect of the first cause a wall 400 feet long and 8 feet high, the effect of the second cause a wall x feet long and 2 feet high.

Statement.

1st Cause	:	*2d Cause*	: :	*1st Effect*	:	*2d Effect.*
6		12		400		x
8		4		8		2

Example 5. — If 8 men can print 6 books of 300 pages each in 12 days of 10 hours' length, how many men will it require to print 100 books of 450 pages each in 20 days, when working 15 hours each day?

Operation.

C	:	c	: :	E	:	e
8		x		6		100
12		20		300		450
10		15				

$$\frac{8 \times 12 \times 10 \times 100 \times 450}{20 \times 15 \times 6 \times 300} = 80. \quad \text{Ans.}$$

Explanation. — The first cause here is 8 men at work 12 days of 10 hours each; the second cause, x men at work 20 days of 15 hours each; the effect of the first cause, 6 books, 300 pages each; the effect of the second cause, 100 books, 450 pages each.

All examples in Compound Proportion can be performed by this formula, — C : c : : E : e; *i.e.* "one cause has to another similar cause the same ratio that the effect of the first cause has to the effect of the second cause."

E. P. B.